



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Richard Anthony Cox et al.
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Title: AIR CONTENT DETERMINATION
Art Unit: Unassigned
Examiner: Unassigned
Docket No.: 7000/1

Assistant Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to examination on the merits, please enter the following amendments. Any deficiencies may be charged to Deposit Account No. 50-1047.

IN THE CLAIMS

Please substitute the following Claims 1-43 for claims 1-32 as originally filed:

1. An instrument for assaying the concentration of one or more of nitrogen dioxide, nitrogen monoxide and ozone in an air sample, the instrument comprising:
an equilibrium altering means for changing the equilibrium between nitrogen monoxide and nitrogen dioxide in the presence of ozone and oxygen; and
a first gas sensor for quantifying the concentration of a first gas selected from the group consisting of nitrogen dioxide, nitrogen monoxide or ozone;
wherein the instrument is adapted to measure the concentration of the first gas whilst the equilibrium between nitrogen monoxide and nitrogen dioxide in the presence of ozone and oxygen is altered, and to thereby calculate the concentration of at least one of nitrogen dioxide, nitrogen monoxide and ozone in the air sample.
2. The instrument of claim 1, wherein the equilibrium altering means comprises an ultraviolet light source.

3. The instrument of claim 2, wherein the ultraviolet light source is switched on and off periodically.

4. The instrument of claim 1, wherein the equilibrium altering means comprises a means for adding at least one gas selected from the group consisting of nitrogen monoxide, nitrogen dioxide or ozone.

5. The instrument of claim 1, wherein the equilibrium altering means comprises a means for removing one or more of nitrogen monoxide, nitrogen dioxide, ozone or oxygen.

6. The instrument of claim 1, wherein the instrument is further adapted to measure the concentration of the first gas at a plurality of time points and to thereby monitor the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

7. The instrument of claim 2, wherein the instrument is further adapted to measure the concentration of the first gas at a plurality of time points and to thereby monitor the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

8. The instrument of claim 3, wherein the instrument is further adapted to measure the concentration of the first gas at a plurality of time points and to thereby monitor the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

9. The instrument of claim 4, wherein the instrument is further adapted to measure the concentration of the first gas at a plurality of time points and to thereby monitor the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

10. The instrument of claim 5, wherein the instrument is further adapted to measure the concentration of the first gas at a plurality of time points and to thereby monitor the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

11. The instrument of claim 1, wherein the first gas sensor is an ozone sensor.
12. The instrument of claim 1, wherein the instrument is further adapted to allow for the effects of at least one factor, which factor is selected from the group consisting of temperature and pressure, on the equilibrium between nitrogen dioxide and nitrogen monoxide.
13. A method for calculating the concentration of one or more of nitrogen dioxide, nitrogen monoxide and ozone in air, the method comprising the steps of:
- activating an equilibrium altering means for changing the equilibrium between nitrogen monoxide and nitrogen dioxide in the presence of ozone and oxygen in an air sample;
 - taking at least three readings of the concentration of a first gas selected from the group consisting of nitrogen dioxide, nitrogen monoxide and ozone, wherein at least one of the at least three readings is taken before the changes caused by the equilibrium altering means reach a steady state; and
 - calculating, on the basis of the at least three readings, the concentration in the air sample of at least one gas selected from the group consisting of nitrogen dioxide, nitrogen monoxide and ozone.
14. The method of claim 13, wherein the equilibrium altering means comprises an ultraviolet light source.
15. The method of claim 14, further comprising the step of switching the ultraviolet source on and off periodically.
16. The method of claim 13, wherein the equilibrium altering means comprises a means for adding a gas selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.
17. The method of claim 13, wherein the equilibrium altering means comprises a means for removing at least one gas selected from the group consisting of nitrogen monoxide, nitrogen dioxide, ozone and oxygen.
18. The method of claim 13, wherein the at least three readings are taken at distinct points in time, and

wherein the concentration of the first gas at the distinct points in time is used to calculate the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

19. The method of claim 13, wherein the at least three readings are of ozone concentration.

20. The method of claim 13, further comprising the step of allowing for the effects of at least one factor, which factor is selected from the group consisting of temperature and pressure, on the equilibrium between nitrogen dioxide and nitrogen monoxide.

21. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 13, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

22. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 14, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

23. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 15, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

24. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 16, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

25. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 17, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

26. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 18, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

27. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 19, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

28. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 20, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

29. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 13, wherein said program is disposed on a tangible medium.

30. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 14, wherein said program is disposed on a tangible medium.

31. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 15, wherein said program is disposed on a tangible medium.

32. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 16, wherein said program is disposed on a tangible medium.

33. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 17, wherein said program is disposed on a tangible medium.

34. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 18, wherein said program is disposed on a tangible medium.

35. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 19, wherein said program is disposed on a tangible medium.

36. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 20, wherein said program is disposed on a tangible medium.

37. A sensing apparatus for detecting components in atmospheric air as the sensor is drawn up through the atmosphere, the sensor comprising:

a sensor element;

shielding means for shielding the sensor element from direct contact with air flow as the sensor is drawn through the atmosphere; and

means for diverting air through the shielding means and over the sensor element as the sensor passes through the atmosphere.

38. The sensing apparatus of claim 37, wherein the means for diverting air comprises a gas conducting member shaped to provide a pressure differential across the shielding means and to cause air to move through the shielding means.

39. The sensing apparatus of claim 37, wherein the gas conducting member is shaped to provide a low pressure region at an entry to the shielding means and thereby draw air through the shielding means into the gas conducting member.

40. The sensing apparatus of claim 37, wherein the gas conducting member comprises a flow restricting member for diverting air that flows through the gas conducting member in use into the shielding means.

41. The sensing apparatus of claim 39, further comprising an aperture adapted to allow water or ice to flow out of the gas conducting member.

42. A sensing apparatus, comprising:
a sensor element;
means for regulating the temperature of the sensor element by providing heat energy to the sensor element; and
means for calculating the air flow across the sensor element from the amount of heat energy supplied to the sensor element.
43. The sensor apparatus of claim 42, further comprising a means for measuring the temperature of the sensor.

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REMARKS

Claims 1-43 are pending in the application.

Claims 1-5 are unchanged.

Claim 6 has been amended to be singularly dependent on Claim 1, rather than to be multiply dependent on claims 1, 2, 3, 4 or 5 as originally filed.

Original Claims 7-17 have been renumbered as Claims 11-21 and amended only to correct the claim dependency due to the addition of new claims 7-10.

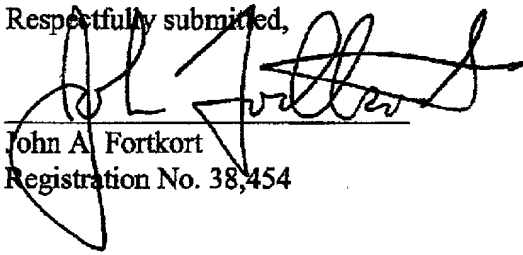
Original Claims 22-32 have been renumbered as Claims 33-43 and amended only to correct the claim dependency due to the addition of new claims 7-10 and 22-28.

A marked up version of the prior pending claims with all changes shown is included for the Examiner's reference.

Should the Examiner be of the view that an interview would expedite consideration of this Preliminary Amendment or of the application at large, request is made that the Examiner telephone the Applicant's attorney at (512) 241-1004 in order that any outstanding issues be resolved. If there are any fees due and owing in respect to this amendment, the Examiner is authorized to charge such fees to deposit account number 50-1047.

2-22-01
Date

Respectfully submitted,


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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Claims 1-5 are unchanged.

Claim 6 (amended). The instrument of claim 1, [2, 3, 4 or 5,] wherein the instrument is further adapted to measure the concentration of the first gas at a plurality of time points and to thereby monitor the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

Claims 7-10 are added as follows:

Claim 7. The instrument of claim 2, wherein the instrument is further adapted to measure the concentration of the first gas at a plurality of time points and to thereby monitor the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

Claim 8. The instrument of claim 3, wherein the instrument is further adapted to measure the concentration of the first gas at a plurality of time points and to thereby monitor the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

Claim 9. The instrument of claim 4, wherein the instrument is further adapted to measure the concentration of the first gas at a plurality of time points and to thereby monitor the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

Claim 10. The instrument of claim 5, wherein the instrument is further adapted to measure the concentration of the first gas at a plurality of time points and to thereby monitor the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

Original Claim 7 is renumbered as Claim 11.

Original Claim 8 is renumbered as Claim 12.

Original Claim 9 is renumbered as Claim 13.

Original Claim 10 is renumbered as Claim 14 (amended). The method of claim [9] 13, wherein the equilibrium altering means comprises an ultraviolet light source.

Original Claim 11 is renumbered as Claim 15 (amended). The method of claim [9] 14, further comprising the step of switching the ultraviolet source on and off periodically.

Original Claim 12 is renumbered as Claim 16 (amended). The method of claim [9] 13, wherein the equilibrium altering means comprises a means for adding a gas selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

Original Claim 13 is renumbered as Claim 17 (amended). The method of claim [9] 13, wherein the equilibrium altering means comprises a means for removing at least one gas selected from the group consisting of nitrogen monoxide, nitrogen dioxide, ozone and oxygen.

Original Claim 14 is renumbered as Claim 18(amended). The method of claim [9] 13, wherein the at least three readings are taken at distinct points in time, and wherein the concentration of the first gas at the distinct points in time is used to calculate the rate at which the balance between nitrogen dioxide and nitrogen monoxide changes in response to the effects of the equilibrium altering means.

Original Claim 15 is renumbered as Claim 19 (amended). The method of claim [9] 13, wherein the at least three readings are of ozone concentration.

Original Claim 16 is renumbered as Claim 20 (amended). The method of claim [9] 13, further comprising the step of allowing for the effects of at least one factor, which factor is selected from the group consisting of temperature and pressure, on the equilibrium between nitrogen dioxide and nitrogen monoxide.

Original Claim 17 is renumbered as Claim 21 (amended). A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim [9, 10, 11, 12, 13, 14, 15 or 16] 13, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

The following claims are added and numbered as Claims 22-28:

Claim 22. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 14, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

Claim 23. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 15, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

Claim 24. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 16, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

Claim 25. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 17, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

Claim 26. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 18, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

Claim 27. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 19, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

Claim 28. A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim 20, wherein the gas is selected from the group consisting of nitrogen monoxide, nitrogen dioxide and ozone.

Original Claim 18 is renumbered as Claim 29 (amended). A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim [9] 13, wherein said program is disposed on a tangible medium.

Original Claim 19 is renumbered as Claim 30 (amended). A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim [10] 14, wherein said program is disposed on a tangible medium.

Original Claim 20 is renumbered as Claim 31 (amended). A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim [11] 15, wherein said program is disposed on a tangible medium.

Original Claim 21 is renumbered as Claim 32 (amended). A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim [12] 16, wherein said program is disposed on a tangible medium.

Original Claim 22 is renumbered as Claim 33 (amended). A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim [13] 17, wherein said program is disposed on a tangible medium.

Original Claim 23 is renumbered as Claim 34 (amended). A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim [14] 18, wherein said program is disposed on a tangible medium.

Original Claim 24 is renumbered as Claim 35 (amended). A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim [15] 19, wherein said program is disposed on a tangible medium.

Original Claim 25 is renumbered as Claim 36 (amended). A computer program which, when loaded onto a computer, is adapted to calculate the concentration of a gas in an air sample in accordance with the method of claim [16] 20, wherein said program is disposed on a tangible medium.

Original Claim 26 is renumbered as Claim 37.

Original Claim 27 is renumbered as Claim 38 (amended). The sensing apparatus of claim [26] 37, wherein the means for diverting air comprises a gas conducting member shaped to provide a pressure differential across the shielding means and to cause air to move through the shielding means.

Original Claim 28 is renumbered as Claim 39 (amended). The sensing apparatus of claim [27] 37, wherein the gas conducting member is shaped to provide a low pressure region at an entry to the shielding means and thereby draw air through the shielding means into the gas conducting member.

Original Claim 29 is renumbered as Claim 40 (amended). The sensing apparatus of claim [27] 37, wherein the gas conducting member comprises a flow restricting member for diverting air that flows through the gas conducting member in use into the shielding means.

Original Claim 30 is renumbered as Claim 41 (amended). The sensing apparatus of claim [29] 39, further comprising an aperture adapted to allow water or ice to flow out of the gas conducting member.

Original Claim 31 is renumbered as Claim 42.

Original Claim 32 is renumbered as Claim 43 (amended). The sensor apparatus of claim [31] 42, further comprising a means for measuring the temperature of the sensor.